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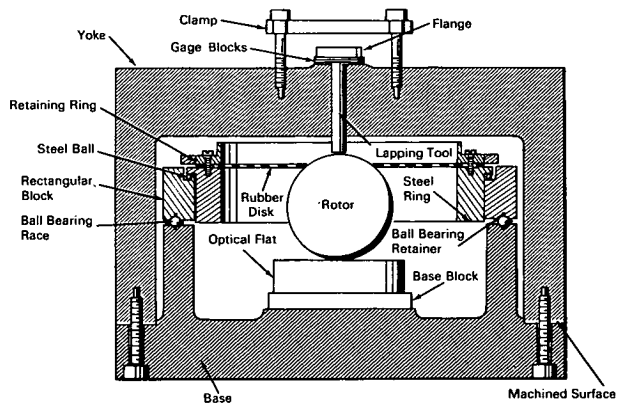
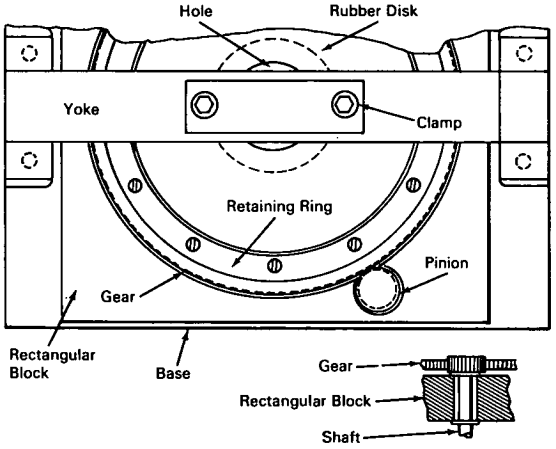
NASA TECH BRIEF

Device Spot-Laps Spheres to Very Close Tolerances





TOP VIEW

The problem:

To design a device that will lap precise amounts of metal from high spots on a spherical body (e.g., a spherical rotor used in an electrostatic gyro) in order to correct for minute surface imperfections.

The solution:

A device that generates the lapped surface with reference to an existing true surface on the spherical workpiece. Lapping is performed by applying a rotary and oscillatory motion to the workpiece while the lapping tool, which is advanced by controlled thermal expansion, is held in contact with the high spot on the workpiece.

How it's done:

The spherical workpiece is placed on an optically flat surface that is cemented to a relatively flat and parallel base block. The workpiece is positioned so that the high spot to be lapped is directly under the end of the lapping tool, which is charged with diamond dust. An annular rubber disk mounted on a steel ring holds the spherical workpiece in position. The steel support ring is mounted on a rectangular block. Rotation of the ring (and workpiece) relative to the rectangular block is accomplished by the gear and pinion drive.

Gage blocks are inserted between the flange of the lapping tool and the yoke to establish the correct initial contact positioning of the lapping tool relative to the workpiece. The clamp is then tightened against the head of the lapping tool in order to lock the tool in position. The lapping operation is performed by rotating the steel ring and oscillating the rectangular block. When it is necessary to advance the lapping tool against the workpiece, the device is heated to provide a controlled rate of expansion. In an experimental design, metals used in the construction of the

(continued overleaf)

device were selected so that the cutting tool advanced 3.635×10^{-6} inch per degree Fahrenheit rise in temperature.

Notes:

1. The cutting tool is advanced under precise control, without friction breakaway, leadscrew errors, or backlash. The arrangement of the components allows precise control of the amount of metal removed, the rate at which it is removed, and the area from which it is removed.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Jet Propulsion Laboratory
   4800 Oak Grove Drive
   Pasadena, California, 91103
   Reference: B66-10175

Patent status:

No patent action is contemplated by NASA.

Source: Howard W. Avery
of General Electric Company
under contract to
Jet Propulsion Laboratory
(JPL-SC-119)